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ONTARIO WATER
RESOURCES COMMISSION

ANNUAL REPORT 1965

MOORE TOWNSHIP (Corunna)

water pollution control plant

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DIVISION OF PLANT OPERATIONS
Ontario Water Resources Commission

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ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Members of the Moore Local Advisory Committee,
Township of Moore.

Gentlemen:

I am pleased to provide you with the 1965 Annual Report for the Moore Township Water Pollution Control Plant, OWRC Project No. 61-S-88.

We appreciate the co-operation you have extended to our Operations staff throughout the year, and trust that continuation of this close association will ensure even greater progress in the sphere of water pollution control.

Yours very truly,

D. S. Caverly,
General Manager.

MOE
WPCP
MBD
1965
MTJB

ONTARIO WATER RESOURCES COMMISSION

801 BAY STREET

TORONTO 5

J. A. VANCE, LL.D.
CHAIRMAN

J. H. H. ROOT, M.P.P.
VICE-CHAIRMAN

D. S. CAVERLY
GENERAL MANAGER

W. S. MacDONNELL
COMMISSION SECRETARY

General Manager,
Ontario Water Resources Commission.

Dear Sir:

I am pleased to provide you with the 1965 Annual Report on the operation of the Moore Township Water Pollution Control Plant, OWRC Project No. 61-S-88.

The report presents design data, outlines operating problems encountered during the year and summarizes in graphs, charts and tables all significant flow and cost data.

Yours very truly,

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

This report provides useful information on the operating efficiency of this project during 1965. It is intended to act as a guide in gauging plant performance. To implement that aim, it includes detailed statistical and cost data, a description of the project and a summary of its operation during the year.

Of particular interest will be the cost data, which show the total cost to the municipality and the areas of major expenditure.

The Regional Operations Engineer is primarily responsible for the preparation of the report, and has compiled and arranged the material. He will be pleased to answer any questions regarding it. Other groups, however, were involved in the production, and these include the statistics section, the Drafting Section of the Division of Sanitary Engineering and the Division of Finance.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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MOORE TOWNSHIP

(CORUNNA)

water pollution control plant

operated for

THE TOWNSHIP OF MOORE

by the

ONTARIO WATER RESOURCES COMMISSION

CHAIRMAN: Dr. James A. Vance

VICE-CHAIRMAN: J. H. H. Root, M.P.P.

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F. A. Voege
K. H. Sharpe
A. K. Watt

COMMISSION SECRETARY

W. S. MacDonnell

DIVISION OF PLANT OPERATIONS

DIRECTOR: B. C. Palmer

Assistant Director: C. W. Perry
Regional Supervisor: A. C. Beattie
Operations Engineer: P. J. Osmond

801 Bay Street Toronto 5

'65 REVIEW

There was little in the operation of the plant during 1965 which differed from the operation in 1964. Once again, only one half of the plant was used for treating the raw sewage. The other half was utilized for aerobic digestion of the waste activated sludge. Chlorination on a 12 month basis was initiated in 1965 for year round disinfection of the final effluent.

The total operating cost for 1965 was $12,595.65, resulting in an increased cost per million gallons from $329.38 in 1964 to $386.11. One of the major reasons for the increase was the payment during the past year of $1342.59 covering the premium for a three-year period of all-risk insurance.

The average daily flow to the plant for the year was 89,375 gallons per day. This represents 28% of the total design capacity of the plant and 56% of the capacity of the one half of the plant presently in use. The maximum average daily flow and subsequent flows on rainy days show that storm flows are entering the sanitary sewer system. This situation was discussed at some length with local officials of the village. Indications now are that the Township will have to enforce its sewer use bylaw.

The raw sewage average strengths of 193 ppm BOD and 228 ppm SS were not substantially different from 1964.

Average reductions of 93% for BOD and 86% for SS were achieved for the year. An average of 4 cu. ft. of grit was removed per million gallons of sewage.

The annual inspection of the sewer collection system during the summer months did not disclose any problems.



S. H. BECHARD
OPERATOR

Project Staff

COMMENTS

The Corunna plant is operated by a single operator. It is possible for one capable operator, with supervision and technical assistance from the OWRC head office staff, to maintain and efficiently operate a project of this size. A part-time assistant is available when Mr. Bechard requires time off for holidays, sickness or attendance at training courses, or when additional assistance is necessary for inspecting and cleaning sewers.

Supervision of the plant is based on a total of 40 hours per week, 36 hours occurring during the period from Monday to Friday inclusive and two hours each on both Saturday and Sunday.

During the past year Mr. Bechard successfully completed the second of three courses sponsored by the Ontario Water Resources Commission for sewage plant operators.

Description of Project

SEWER SYSTEM

The sewage is collected in a sanitary sewer system and flows by gravity to the treatment plant.

INFLUENT WORKS

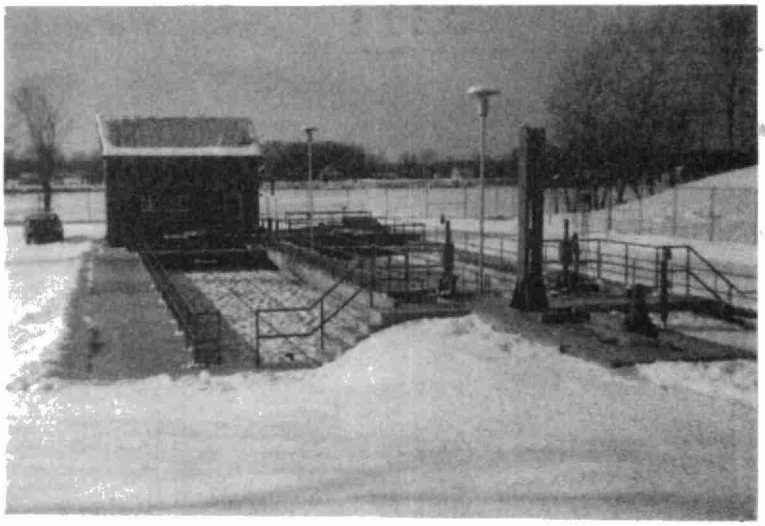
The sewage enters the plant through a 12 inch diameter sewer and passes through a comminutor which shreds the larger solids. A bypass channel equipped with a manually cleaned bar screen is used when the comminutor is not in operation.

GRIT REMOVAL AND AERATION

The flow from the influent works enters two rectangular concrete tanks. Each tank is baffled into two sections, a grit removal section and an aeration section. The velocity of flow is sufficiently reduced in the grit section to allow grit and sand to settle out into a hopper. The grit and sand are removed from the hopper by an air lift eductor which discharges the material onto a decanting platform from which it is manually removed. Flow then enters the aeration section where it is mixed with activated sludge returned from the final clarifiers. Activated sludge consists of biological communities of micro-organisms. The resulting mixture, or mixed liquor as it is called, is retained in the tank for a period of approximately 24 hours at design flow during which time it is mixed and aerated. This process involves the removal of soluble, colloidal and suspended materials from the sewage by biological oxidation. Compressed air which is discharged through air diffusers mounted along one side of each aeration tank supplies the oxygen for the process and also imparts a spiral flow pattern to the mixed liquor which prevents settling in the tanks.

FINAL CLARIFIERS

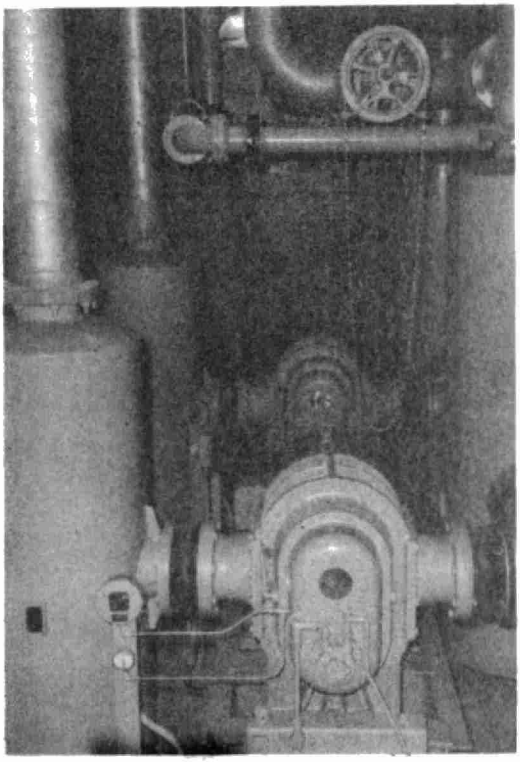
The aerated mixed liquor from the aeration tanks then flows to two final clarifiers which have a retention period of approximately 5.7 hours at design flow. This allows the activated sludge to separate from the treated sewage and to settle to the bottom of the tank. It is collected by scraping mechanisms and then removed to the return sludge sump from which it can be returned to the aeration section or wasted to the sludge holding tank. The treated sewage flows over the weirs and into the final effluent channel header. A Parshall Flume located at the end of the channel measures the final effluent flow. Chlorine is added to the clear final effluent downstream of the Parshall Flume and the effluent is then discharged to the St. Clair River through an outfall sewer.



MAIN BUILDING AND AERATION TANKS



INFLUENT WORKS AND COMMINUTOR



AIR BLOWERS

PROJECT COSTS

NET CAPITAL COST (Final)		$762,379.92
DEDUCT - Portion Financed by CMHC (Final)	$300,550.70	
Long Term Debt to OWRC		$461,829.22
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1965		$ 19,469.45
Net Operating		$ 12,595.65
Debt Retirement		9,262.00
Reserve		4,892.50
Interest Charged		25,813.51
TOTAL		$ 52,563.66

RESERVE ACCOUNT

Balance at January 1, 1965	$ 5,099.50
Deposited by Municipality	4,892.50
Interest Earned	386.67
Balance at December 31, 1965	$ 10,378.67

MONTHLY OPERATING COSTS

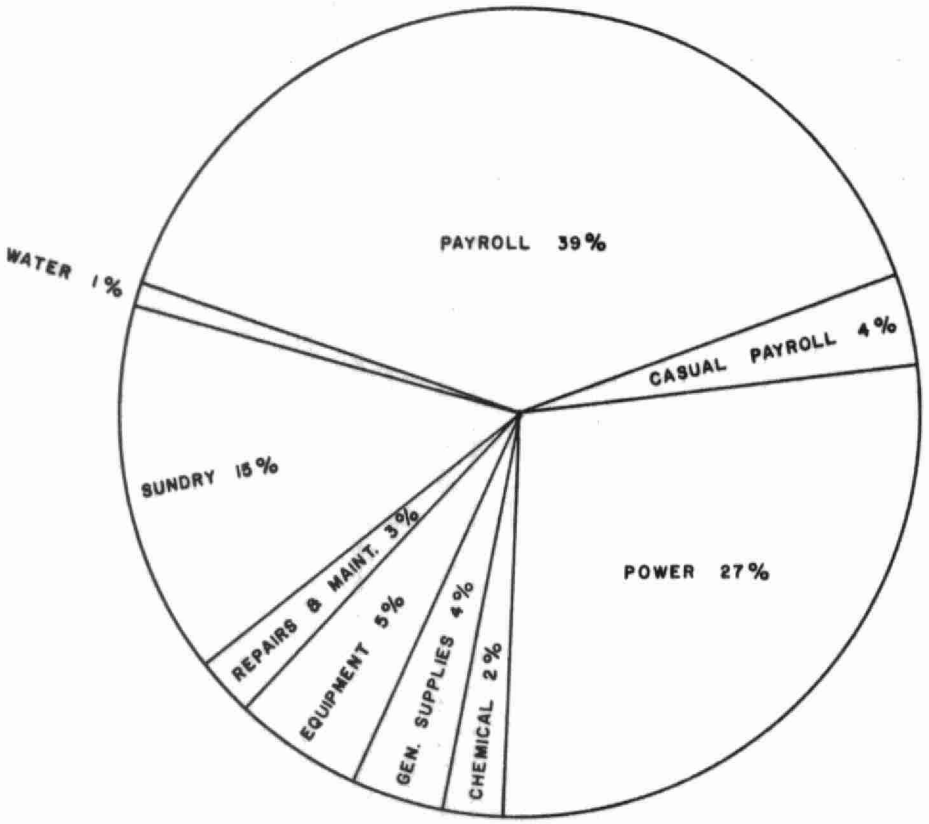
MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY	WATER
JAN	392.91	357.06					25.85				
FEB	810.73	357.06	10.80		339.77		43.45			59.65	
MARCH	2148.80	402.51			387.81				15.89	1342.59	
APRIL	1012.16	418.07	57.60		357.52	106.22	26.13			12.09	34.53
MAY	1107.64	559.95			308.45		73.16	115.81		50.27	
JUNE	1234.21	373.30	95.40		293.60		56.15	335.57		80.19	
JULY	846.58	373.30	25.20		299.54		34.96	3.55	78.96	12.09	18.98
AUG	1176.84	373.30	165.60		304.29	106.22	31.40	151.87		44.16	
SEPT	856.16	373.30	3.60		281.72		27.55	45.12	80.00	12.09	32.78
OCT	1000.29	559.95	3.60		288.85		24.55		76.25	47.09	
NOV	863.51	401.70	3.60		284.77		74.45		80.00	18.99	
DEC	1155.82	387.50	72.00		310.00	106.22	66.35			190.87	22.88
TOTAL	12595.65	4937.00	437.40		3456.32	318.66	484.00	651.92	331.10	1870.08	109.17

YEARLY OPERATING COSTS

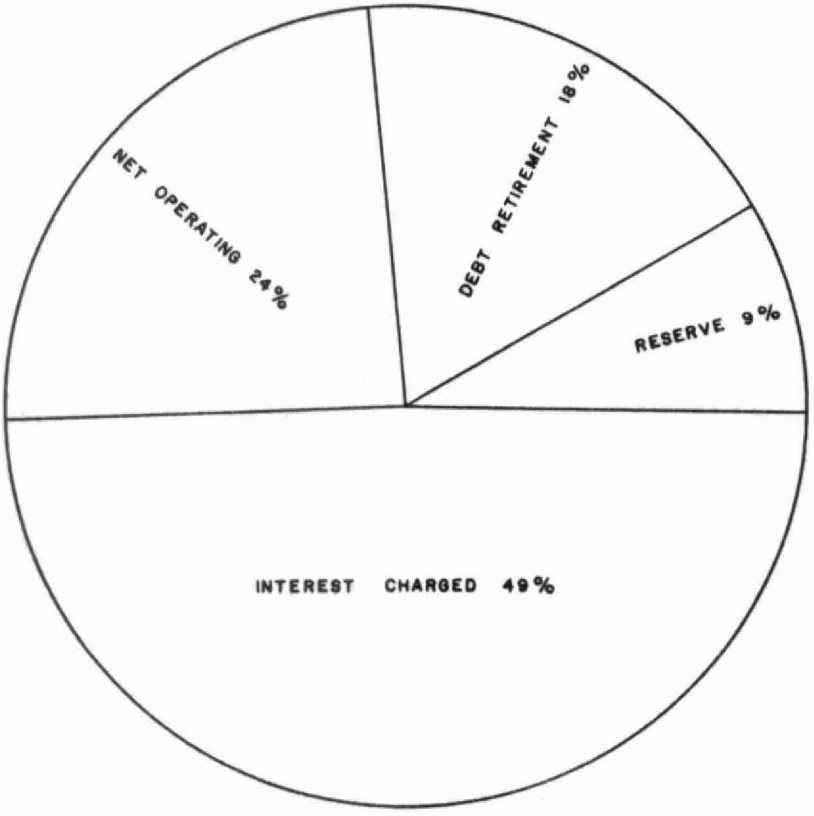
YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS	COST PER LB. OF BOD REMOVED
1964	32.020	$ 10546.67	* $ 7.22	$ 329.38	17 CENTS
1965	32.622	12595.65	8.58	386.11	21 CENTS

* BASED ON ANNUAL POPULATION ESTIMATE AND 3.9 PERSONS PER FAMILY

1965 OPERATING COSTS

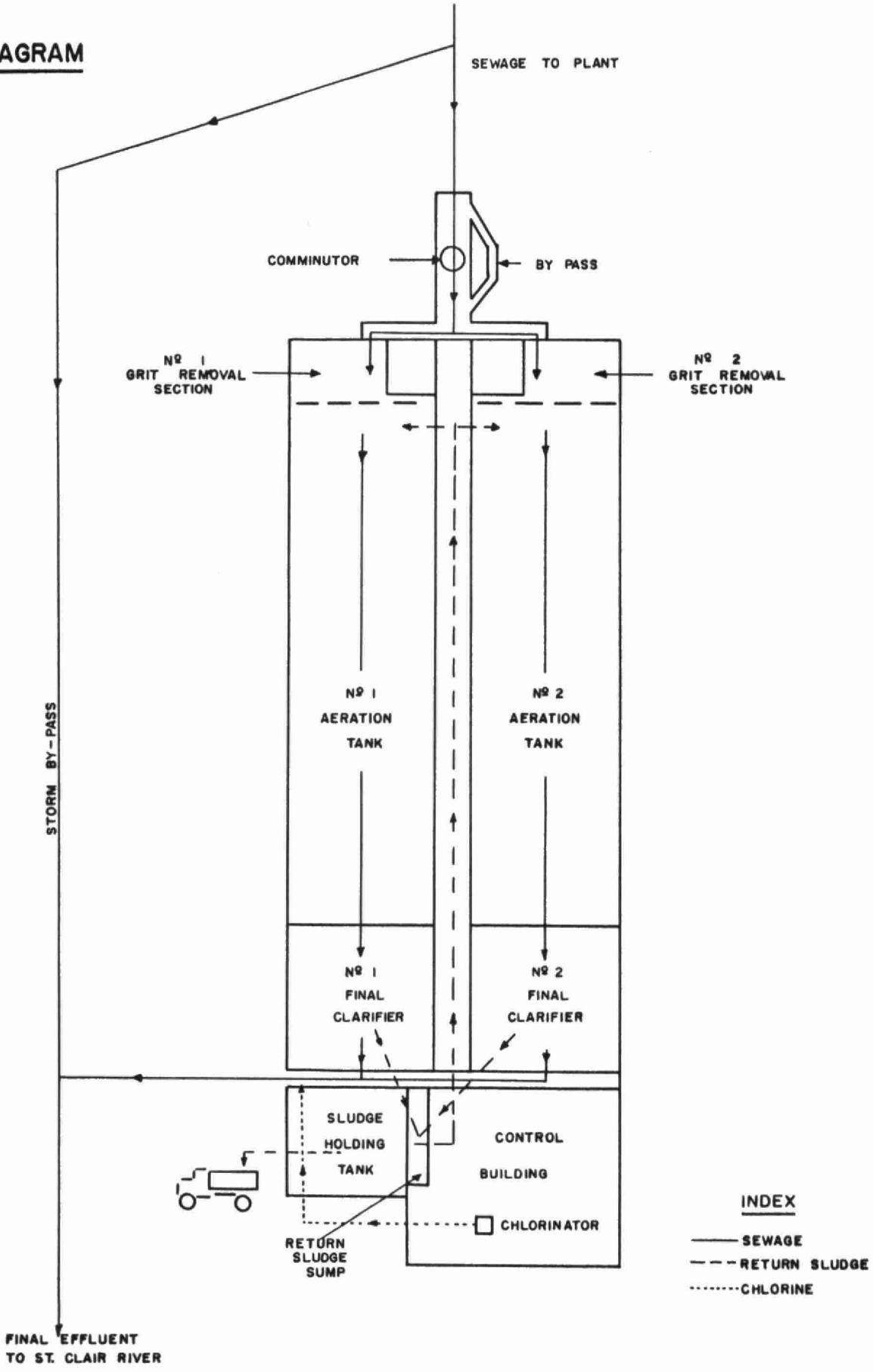


TOTAL ANNUAL COST



Technical Section

FLOW DIAGRAM



Design–Data

GENERAL

Type of Plant - Extended Aeration

Design Population - 4,000 persons

Per Capita Flow - 80 gpd

Design Plant Flow - 320,000 gpd

Five Day BOD

Raw Sewage - 150 ppm

Removal - 90-95%

Suspended Solids

Raw Sewage - 150 ppm

Removal - 90-95%

Influent Sewer

12 - inch diameter, gravity flow

Screening

Bypass channel equipped with a manually cleaned bar screen with one inch c to c spacing.

Comminution

1 - Model 15-C-4 comminutor as manufactured by Worthington Corporation.

GRIT REMOVAL

2 - Aer-Degritter systems as manufactured by Chicago Pump utilizing a portion of the aeration tanks. Detention - 17 minutes. Each system equipped with a 4 inch diameter air lift eductor with a capacity of 100 gpm and a manually cleaned decanting platform.

AERATION TANKS

2 - Rectangular concrete tanks, each 85.0 ft. x 22.0 ft. x 14.25 ft. (average liquid depth). Total volume is 51,907 cu. ft. of which 607 cu. ft. is used for grit tanks. Detention period is 24 hours at design flow assuming no return sludge.

AIR DIFFUSERS

A fixed header pipe at the bottom of each tank is equipped with 22 Chicago Pump Sparjers with teflon inserts. There are four jets per diffuser. Sparjers are placed at 20 inch centres and are capable of diffusing 10 to 20 cu. ft. per minute.

AIR SUPPLY

2 - 'Sutorbilt" size 10 x 11 Series 3200 air blowers each having a capacity of 1000 cfm @ 7.0 psi. Each blower is driven by a 50 hp Tamper electric motor,

FOAM CONTROL

A spray water system with one Smart-Turner Horizontal non-clog pump having a capacity of 125 gpm @ 100 ft. head and powered by a 10 hp. General Electric motor.

FINAL SETTLING TANKS

2 - Square concrete tanks each 22.0 ft. x 22.0 ft. x 12.50 ft. (liquid depth). Total volume 12,000 cu. ft. Detention period at design flow is 5.7 hours Surface settling rate is 330 gallons per sq. ft. of tank per day. Weir overflow rate is 2350 gals. per lin. ft. of weir per day Each tank is equipped with a rotary plough Squarex Type "AZ" collector as manufactured by Dorr-Oliver-Long Limited.

RETURN SLUDGE PUMPS

No. 1 - Smart Turner horizontal non-clog pump with a capacity of 0 - 333 gpm @ 25 ft. head driven by a 5 hp U. S. Varidrive motor.

No. 2 - Smart Turner horizontal non-clog pump with a capacity of 33 gpm @ 25 ft. head and driven by a 5 hp General Electric motor.

CHLORINATION

1 - Wallace and Tiernan Model A-741 manually controlled chlorinator capable of chlorinating at a rate of 100 pounds of chlorine per 24 hours. 150 pound cylinders are used. There is no chlorine contact chamber since there is sufficient detention in the outfall sewer.

SLUDGE HOLDING TANK

One 17.0 ft. x 17.0 ft. x 15.0 ft. deep tank having a volume of 23,000 gallons (assuming a 12.8 ft. sludge depth). Corresponding to 0.93 cu. ft. per capita.

FLOW MEASUREMENT

A 6 inch Parshall Flume located in the final effluent channel.

OUTFALL SEWER

One 48 inch diameter corrugated metal pipe - 196 feet long.

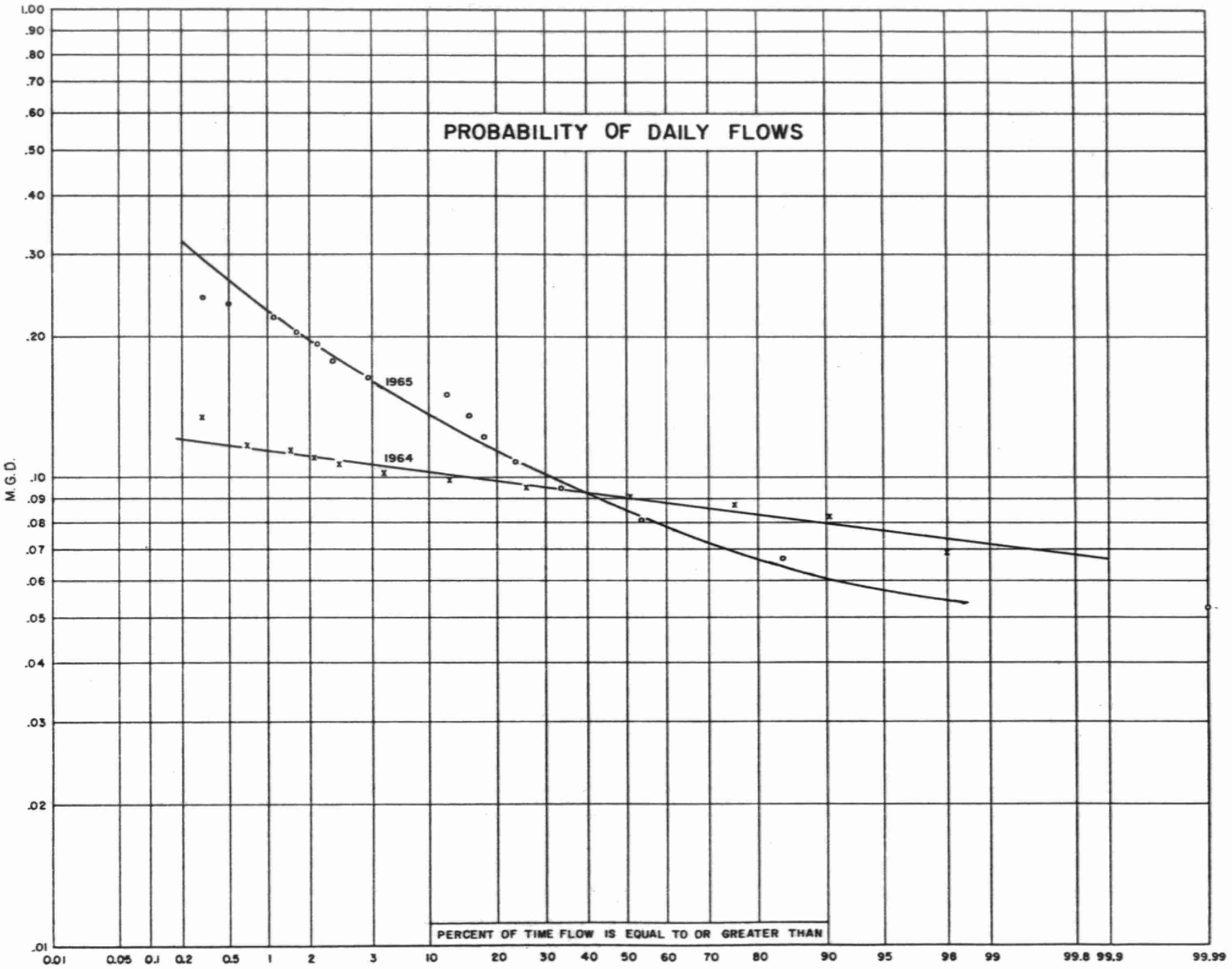
Process Data

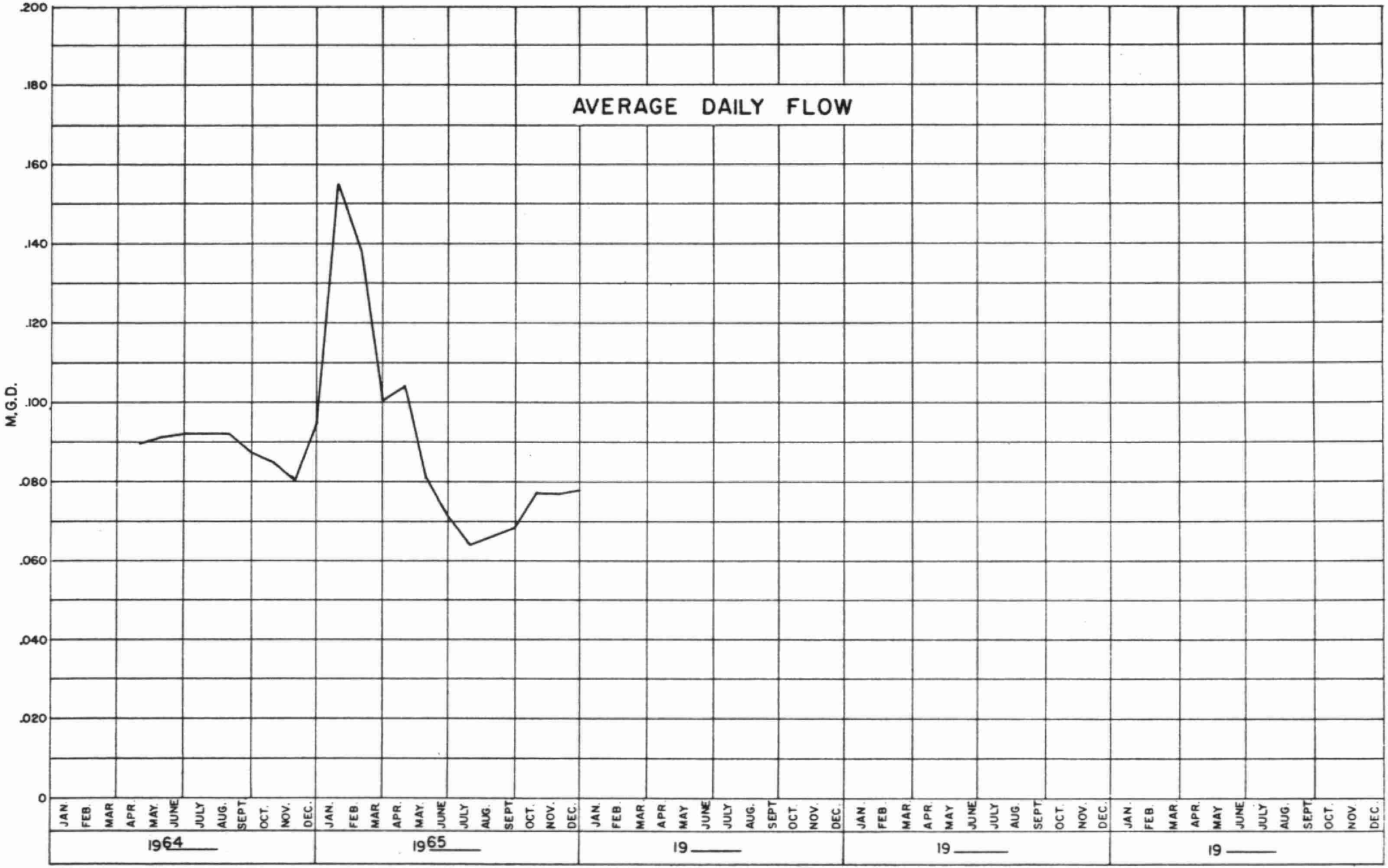
GENERAL

The following data provide information regarding the flows treated by the plant, the degree of treatment achieved and the chlorine required for disinfection.

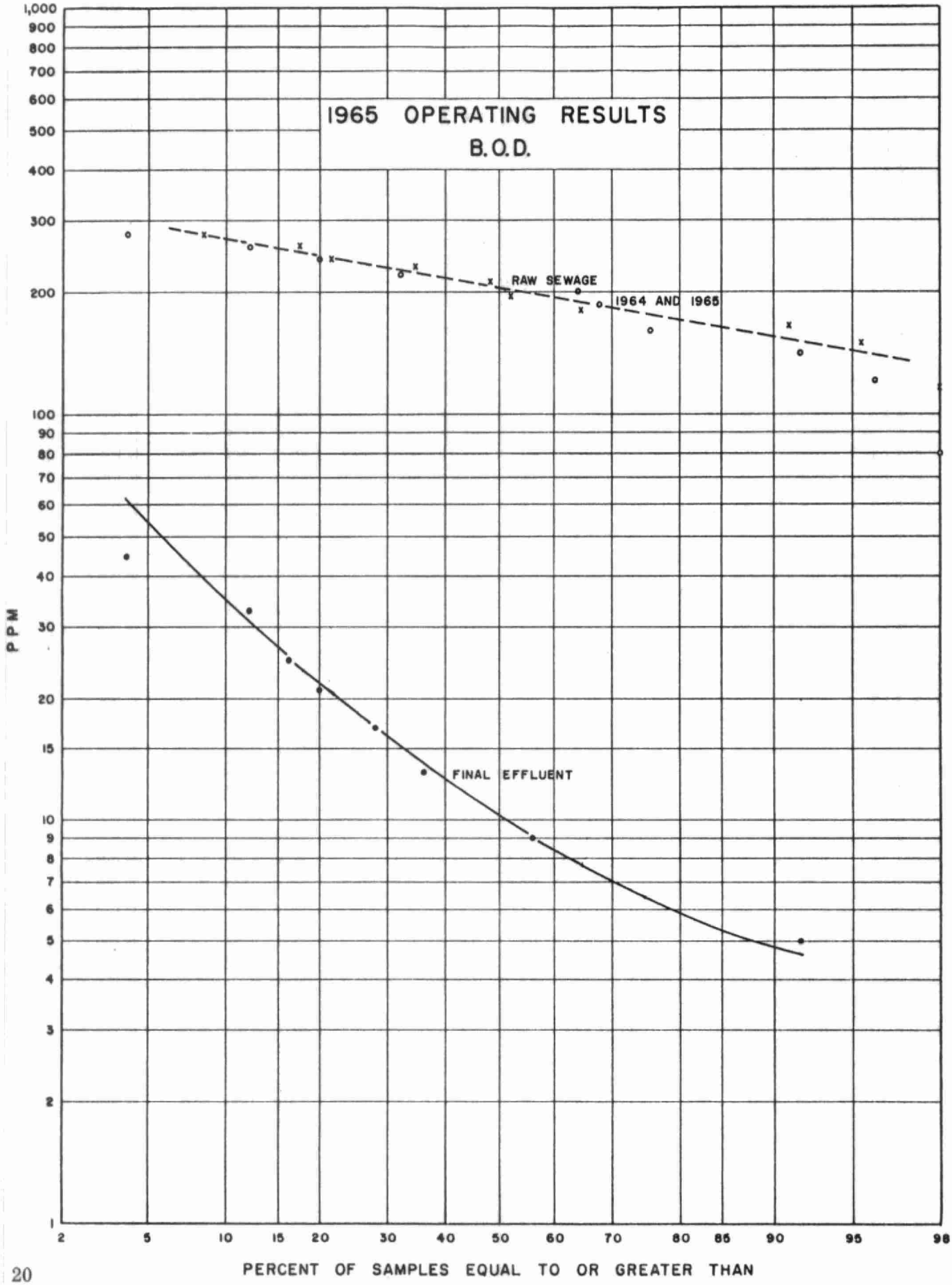
FLOW

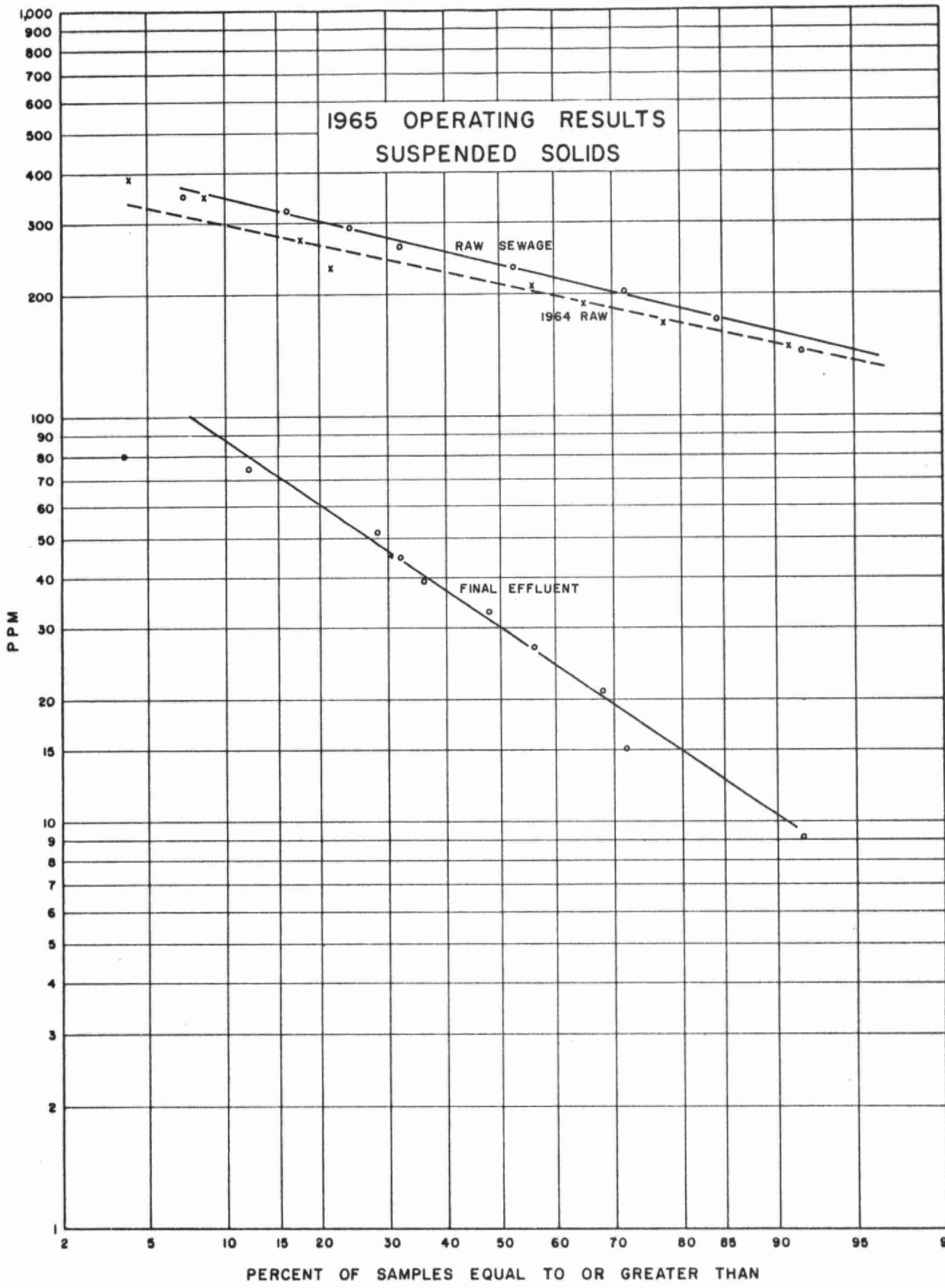
During 1965, a total of 32.622 million gallons was treated at the plant. This represents an average daily flow of 89,375 gallons per day. The maximum average daily flow received was 249,000 on March 6. This particularly high flow was due to severe rains during the day. The maximum flow for one month was 4.809 millions or 155,129 gallons per day and occurred in January. Based on the month of January the plant operated at 48.5% of design capacity. On the basis of the year's average flow the plant operated at 28% of design capacity.

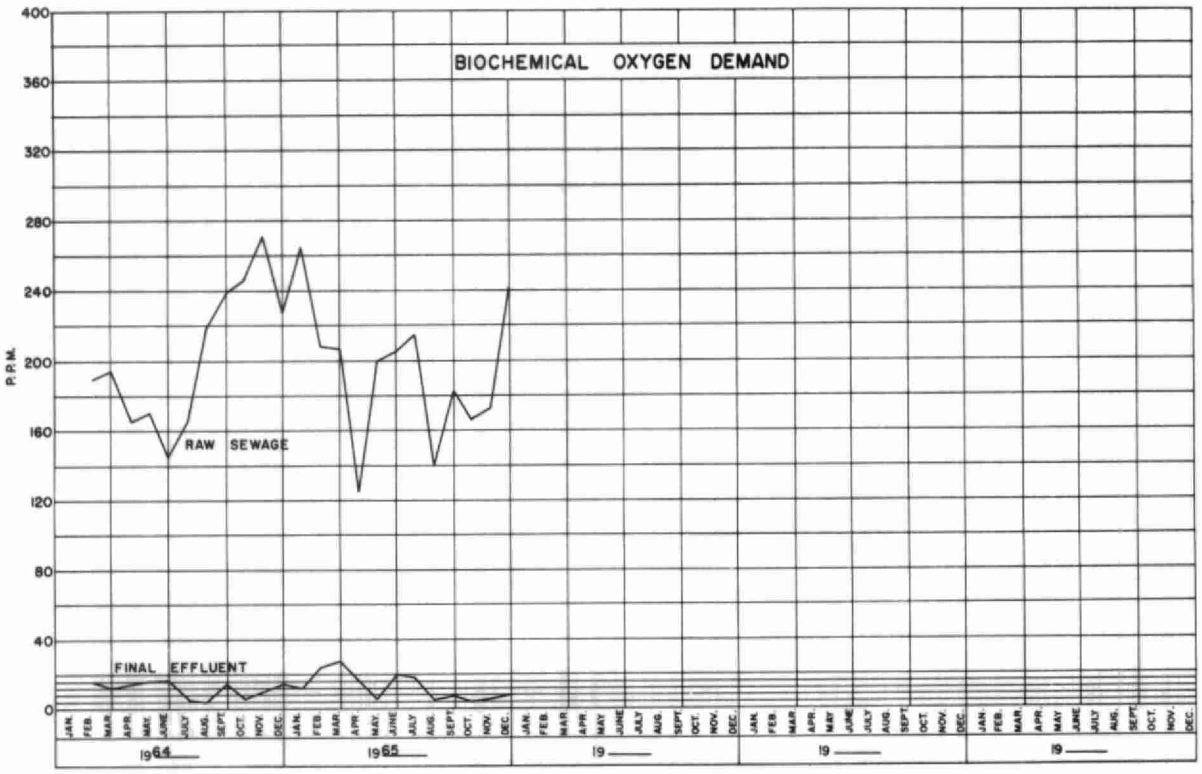

PROBABILITY OF DAILY FLOWS
M.G.D.
1.00
.90
.80
.70
.60
.50
.40
.30
.20
.10
.09
.08
.07
.06
.05
.04
.03
.02
.01
1965
1964
PERCENT OF TIME FLOW IS EQUAL TO OR GREATER THAN
0.01
0.05
0.1
0.2
0.5
1
2
3
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99


AVERAGE DAILY FLOW
M.G.D.
.200
.180
.160
.140
.120
.100
.080
.060
.040
.020
0
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT OCT. NOV. DEC.
1964
1965
19 ____
19 ____
19 ____

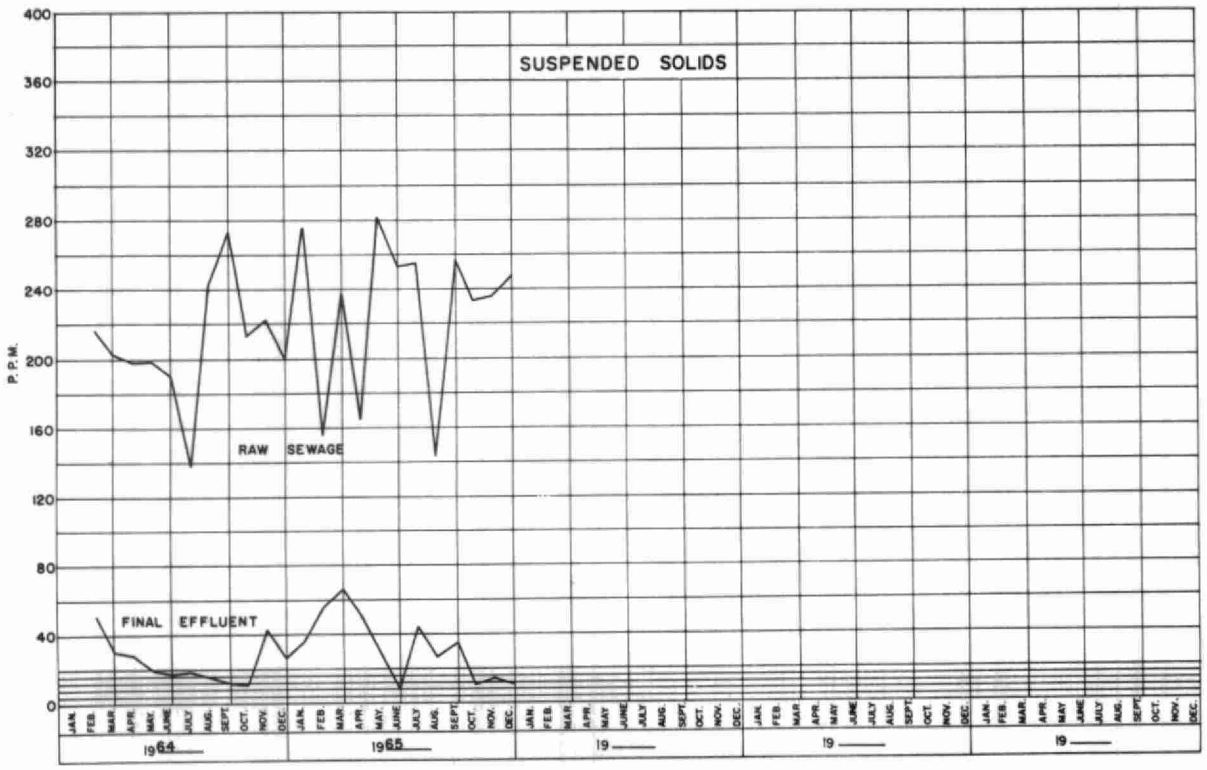
19


1965 OPERATING RESULTS
B.O.D.
RAW SEWAGE
1964 AND 1965
FINAL EFFLUENT
PPM
PERCENT OF SAMPLES EQUAL TO OR GREATER THAN
1,000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98


1965 OPERATING RESULTS
SUSPENDED SOLIDS
RAW SEWAGE
1964 RAW
FINAL EFFLUENT
PPM
1,000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
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4
3
2
1
2
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70
80
85
90
95
98
PERCENT OF SAMPLES EQUAL TO OR GREATER THAN



MONTHLY VARIATIONS

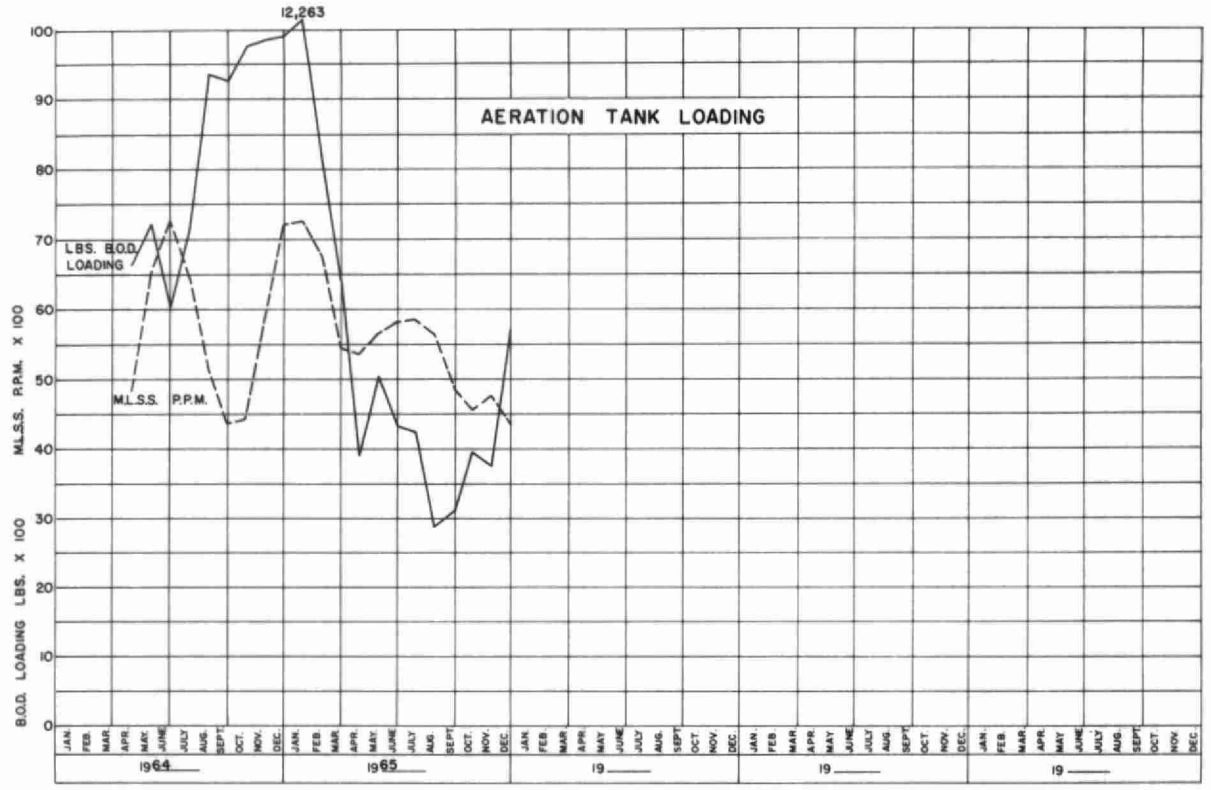


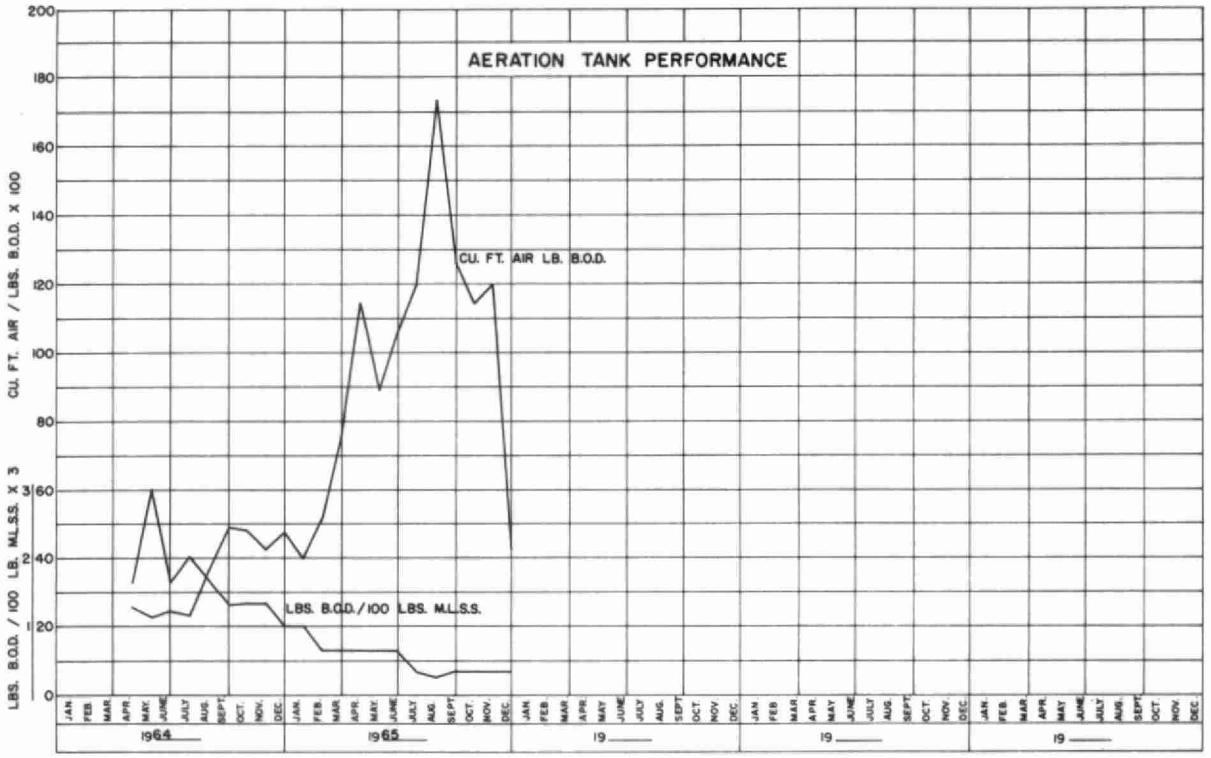
GRIT, B.O.D AND S.S. REMOVAL

MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	255	12	95.0	5.8	276	36	87.0	5.8	8.5
FEB.	208	24	88.5	3.6	155	56	64.0	1.9	12.5
MAR.	207	27	87.0	2.8	238	66	72.0	2.7	19.0
APR.	125	16	87.0	1.7	165	51	69.0	1.8	15.0
MAY	200	6	97.0	2.4	283	30	89.5	3.2	13.0
JUNE	205	19	90.5	2.0	254	9	96.5	2.6	11.0
JULY	215	18	91.5	2.0	255	44	82.5	2.1	9.5
AUG.	141	4.8	96.5	1.4	142	27	81.0	1.2	9.5
SEPT.	182	7	96.0	1.5	256	34	86.5	2.2	7
OCT.	168	4.1	97.5	2.0	233	10	95.7	2.7	9.5
NOV.	172	5.3	97.0	1.8	236	14	94.0	2.4	5.9
DEC.	242	7.6	97.0	2.8	247	11	95.5	2.8	10.5
TOTAL	-	-	-	29.4	-	-	-	31.8	130.9
AVG.	193	13	93.0	2.4	228	32	86.0	2.6	10.9

COMMENTS

There was very little change in the strength of the raw sewage in 1965 as compared to the previous year. It is interesting to note that the effluent quality improved considerably over the last seven months of the year when compared to the first five months. The reasons for this appear to be two fold. Firstly the plant flows were more stable following the conclusion of the higher precipitation period in the winter and spring. Secondly the suspended solids in the aeration section were reduced from over 7000 ppm to approximately 4400 ppm.


AERATION TANK LOADING
12,263
LBS. B.O.D. LOADING
M.L.S.S. P.P.M.
B.O.D. LOADING LBS. X 100
M.L.S.S. P.P.M. X 100
0
10
20
30
40
50
60
70
80
90
100
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT OCT. NOV. DEC.
1964
1965
19


AERATION TANK PERFORMANCE
CU. FT. AIR LB. B.O.D.
LBS. B.O.D. / 100 LBS. M.L.S.S.
CU. FT. AIR / LBS. B.O.D. X 100
LBS. B.O.D. / 100 LB. M.L.S.S. X 3
0
20
40
60
80
100
120
140
160
180
200
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT OCT. NOV. DEC.
1964
1965
19

AERATION SECTION

MONTH	*B.O.D. P.P.M.	M.L.S.S. P.P.M.	LBS. B.O.D. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. B.O.D. REMOVED
JANUARY	255	7247	3	4000
FEBRUARY	208	6780	2	5333
MARCH	207	5448	2	7500
APRIL	125	5390	2	11428
MAY	200	5656	2	8889
JUNE	205	5809	2	10746
JULY	255	5854	1	12000
AUGUST	141	5665	1	17349
SEPTEMBER	182	4852	2	12631
OCTOBER	168	4564	2	11428
NOVEMBER	172	4466	2	12000
DECEMBER	242	4334	2	8780
TOTAL	-	-	-	-
AVERAGE	193	5505	2	10174

* raw BOD - no primaries

COMMENTS

Again in 1965 one aeration tank was used as an aerobic digester. Activated sludge was once again wasted to the sludge holding tank where it was decanted and the thickened sludge pumped to the aerobic digester.

The aerobic digester was dewatered during the fall of the year and the Sparjers removed. This will eliminate the plugging problem associated in the past with these diffusers due to the high proportion of solids carried in this tank.

It was not necessary to haul sludge by truck in 1965. The resourcefulness of the plant staff resulted in the disposal of all excess sludge on the plant grounds.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	4.809	-	-
FEBRUARY	3.903	-	-
MARCH	3.135	224	7.14
APRIL	3.127	210	6.72
MAY	2.513	217	8.64
JUNE	2.119	210	9.91
JULY	1.983	217	10.94
AUGUST	2.052	217	10.58
SEPTEMBER	2.034	210	10.32
OCTOBER	2.388	217	9.09
NOVEMBER	2.187	210	9.60
DECEMBER	2.372	217	9.15
TOTAL	32.622	2149	-
AVERAGE	2.718	215	8.99

COMMENTS

Chlorination is now practiced at this plant on a twelve month basis. A total of 2149 pounds of chlorine was used during the year for disinfection. As a check on the 15-minute residual is impossible at this plant because of the location of the outfall sewer the dosage is kept at a sufficiently high level to ensure a safe effluent.

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CONCLUSIONS

During the past year efficient secondary treatment was provided to sanitary sewage from the Village of Corunna. Sludge disposal was handled by the chief operator in a most resourceful manner resulting in considerable financial saving to the project. The structure, equipment and grounds were well maintained during the year. The assistance of OWRC technical staff and a first-class preventative maintenance program have resulted in an outlook for the coming year which does not anticipate any serious problems .

RECOMMENDATIONS

It is recommended that the Township of Moore enforce its sewer use bylaw to prevent connections of roof water leaders and field drainage tiles to the sanitary sewer system.

MOE/WPCP/MOO/1965/ATIZ
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(Corunna) 1965 water atke
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